Dina **Mistry**

Complex Systems Researcher · Network Scientist · Physicist
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Summary

Researcher in the Network Science Institute at Northeastern University, with an interdisciplinary background in physics, network science and epidemiological modeling. 5+ years experience modeling complex systems found in the real world and contagion phenomena occurring within them. My interests lie in understanding the underpinnings of complex systems in the real world and developing methods for data driven research in public health and social good.

Education

Northeastern University — *Boston, MA*
Ph.D. in Physics — *Jan. 2014 - Exp. Jan. 2019*
Dissertation on Complex Networks & Contagion Phenomena, *Advisor: Prof. Alessandro Vespignani*

Northeastern University — *Boston, MA*
M.Sc. in Physics — *Sept. 2012 - Jan. 2014*

University of Toronto — *Toronto, Canada*
Hon. B.Sc. in Physics & Astronomy, Minor in Mathematics with High Distinction — *Sept. 2007 - June 2012*
Undergraduate thesis on the Axisymmetric Geometry of Saturn's Magnetic Fields, *Advisor: Prof. Sabine Stanley*

Skills & Expertise

Programming Python (NumPy, Pandas, scikit-learn, NLTK, Basemap), C/C++, MATLAB, Mathematica, Spark, SQL
Visualization Matplotlib, d3, Gephi

Experience

Northeastern University — *Boston, MA*
Graduate Researcher, MOBS Lab | Network Science Institute

Synthetic Contact Networks — *Oct. 2015 - PRESENT*
- Developed adaptive algorithms to generate synthetic contact networks from real world census and survey data in multiple large, diverse countries accounting for 46% of the world's population, and integrated them into infectious disease models
- Supervised graduate students in developing their own algorithms to generate synthetic contact networks
- Implemented MCMC methods and mathematical simulations to infer model parameters and validate against serological data
- Maintenance of database with contact networks for 300 global locations
- Designing a website and Python package to provide the research community with a global database of contact patterns, modeling and visualization tools to implement for research on public health emergencies
- Invited speaker at the 2017 Conference on Complex Systems

H1N1 Pandemic Scenario Analysis — *Jan. 2015 - PRESENT*
- Characterized global epidemic spreading patterns across different scenarios using commercial airline mobility network data from 3200 transportation hubs, statistical mechanics, information theoretic measures, and unsupervised machine learning algorithms
- Analyzed data from stochastic micro-simulations of pandemic scenarios originating in 7 different geolocations
- Identified and visualized geospatial and temporal predictability of outbreak patterns from stochastic micro-simulations of pandemics starting in different locations and seasons

Spreading of Zika virus in the Americas (www.zika-model.org) — *Jan. 2016 - May. 2017*
- Worked to produce a stochastic data driven vector borne model of the 2015-2016 Zika outbreak in real-time; in collaboration with diverse research groups
- Aided in streamlined analysis pipeline of simulation data for time sensitive reports to public health agencies
- Collected, processed, and analyzed epidemiological case report data from Pan-American countries for model calibration

Cover Music Network — *Sept. - Dec. 2014*
- Web scraped a database of musicians and cover songs (whosampled.com) to create a temporal network of connected artists
- Structured, cleaned, analysis and visualization of network with 70,000+ cover songs and 28,000+ artists spanning over 400 years
- Presented findings at final course examination for PHYS 5116: Complex Networks (slides can be found here)

Committed activists and the reshaping of status-quo social consensus — *May 2013 - Oct. 2015*

- Implemented agent based models of negotiation on conventions and opinion flipping in temporal social networks
- Explored campaign strategies to reduce the time and critical mass needed to drive populations towards consensus, as well as the hindering effects of community structures (echo chambers)
- Presented findings to 50 scientists at the 2017 International School and Conference on Network Science

Advanced Schools & Programs

Université Laval — *Quebec City, Canada*

Complex Networks Winter Workshop

Dec 15 - 22 2018

University of Washington — *Seattle, WA*

7th Annual Summer Institute in Statistics and Modeling in Infectious Diseases

Certificates obtained in the modules: — *July 5 - 22 2015*

- Probability and Statistical Inference
- Stochastic Epidemic Models with Inference
- Simulation-based Inference for Epidemiological Dynamics
- MCMC I for Infectious Diseases
- MCMC II for Infectious Diseases

Presentations

Invited Talks

Institute for Disease Modeling — *Seattle, WA*

The effects of complex networks on infectious disease spreading — *Sept. 2018*

Humanyze — *Palo Alto, CA*

Exploring the effects of complex networks on contagion phenomena — *Sept. 2018*

Conference on Complex Systems — *Cancun, Mexico*

The influence of cultural and societal diversity on epidemic spreading — *Sept. 2017*

Professional Presentations

3MinuteThesis, GWISE, Snell Library, Northeastern University — *Boston, MA*

Data-driven approaches to infectious disease modeling and the role of human interaction networks — *Oct. 2018*

International Conference on Complex Networks — *Boston, MA*

A data-driven approach to infer social contact networks in the context of infectious disease modeling — *Mar. 2018*

Grad Research Panel, Snell Library, Northeastern University — *Boston, MA*

Data-driven approaches to stochastic infectious disease modeling — *Feb. 2018*

International School and Conference on Network Science — *Indianapolis, IN*

Committed activists and the reshaping of status-quo social consensus — *June 2017*

Poster Presentations

Research, Innovation, and Scholarship Expo, Northeastern University — *Boston, MA*

Using data-driven models to infer social contact patterns in the context of epidemics — *Apr. 2016*

Publications

5. **D. Mistry**, A. Pastore y Piontti, M. Litvinova, M. F. C. Gomes, S. A. Haque, K. Mu, X. Xiong, Q. Liu, L. Fumanelli, S. Merler, M. Ajelli, A. Vespignani. A data approach to inferring social contact patterns: the influence of cultural and societal diversity on infectious disease spreading around the world. *Manuscript and website in progress.*

4. **D. Mistry**, K. Sun, A. Pastore y Piontti, M. F. C. Gomes, L. Rossi, A. Vespignani. Characterizing the global spread of epidemics and their predictability through human mobility networks. *Manuscript in progress.*

3. K. Sun, Q. Zhang, A. Pastore-Piontti, M. Chinazzi, **D. Mistry**, N. E. Dean, D. P. Rojas, S. Merler, P. Poletti, L. Rossi, M. E. Halloran, I. M. Longini, A. Vespignani. Quantifying the risk of Zika virus local transmission in the continental US during the 2015-2016 ZIKV epidemic. BioMed Central Medicine. 2018. *Manuscript accepted for publication.* bioRvix link

2. Q. Zhang, K.Sun, M. Chinazzi, A. Pastore-Piontti, N. E. Dean, D. P. Rojas, S. Merler, **D. Mistry**, P. Poletti, L. Rossi, M. Bray, M. E. Halloran, I. M. Longini, A. Vespignani. Spreading of Zika virus in the Americas. Proceedings of the National Academy of Sciences.114. 22.E4334-E4343.2017. PNAS link

1. **D. Mistry** Q. Zhang, N. Perra, A. Baronchelli. Committed activists and the reshaping of status-quo social consensus. Phys. Rev. E.92. 042805. 2015. APS link

Teaching

2014	**Physics Lab Instructor**, U.S. Pathway Program, a summer bridge program for international students from China and Nigera	*Northeastern University*
2012-2014	**Physics Lab Instructor**, Introductory Physics Labs (16 sections), Department of Physics	*Northeastern University*
2013-2014	**Physics Workshop Leader**, (6 sections) Department of Physics	*Northeastern University*
2012	**Interactive Learning Sessions Teaching Assistant**, Department of Physics	*Northeastern University*
2011	**AST201H1 Teaching Assistant**, Department of Astronomy & Astrophysics	*University of Toronto*

Service & Leadership

2018	**Women's Summer Retreat organizer**, GWISE (Graduate Women in Science and Engineering)	*Cambridge, MA*
2018	**Program Committee member, Art of Networks reception and Society of Young Network Scientists (SYNS) pre-conference event organizer**, International Conference on Complex Networks	*Boston, MA*
2018	**Panel member, Graduate School & Research**, Dept. of Physics, Northeastern University	*Boston, MA*
2017	**Manuscript subreviewer**, PLOS ONE	
2017	**Panel member, Diversity and Inclusion Town Hall**, College of Science, Northeastern University	*Boston, MA*
2017	**Workshop organizer on professional development**, Dept. of Physics, Northeastern University	*Boston, MA*
2016-2018	**Graduate Student Union Dept. Leader**, Dept. of Physics, Northeastern University	*Boston, MA*
2014-2016	**Physics Graduate Student Representative**, Northeastern University	*Boston, MA*
2013	**TEDx Cambridge Volunteer**, TEDx Cambridge	*Cambridge, MA*
2012	**Transit of Venus Outreach Science Volunteer**, Dept. of Astronomy & Astrophysics	*Toronto, Canada*
2011-2012	**Vice President of Academic Affairs**, Physics & Astronomy Student Union, University of Toronto	*Toronto, Canada*

Awards & Honours

2014 - 2018	**Graduate Research Assistantship Award**, Department of Physics	Northeastern University
2015	**Summer Institute in Statistics and Modeling in Infectious Diseases (SISMID) Scholarship**, 7th Annual Summer Institute	University of Washington
2012 - 2014	**Graduate Teaching Assistantship Award**, Department of Physics	Northeastern University
2012	**Anna & Alex Beverly Memorial Fellowship**, for future graduate studies	University of Toronto
2012	**Marie Sklodowska-Curie Association Undergraduate Scholarship**, for academic excellence in Physics	University of Toronto
2011	**Undergraduate Summer Research Award**, Highly competitive research assistantship award. Conducted experiments to study the nonlinear growth patterns of stalactites. *Advisor: Prof. Stephen Morris.*	University of Toronto
2008-2012	**Dean's List of Scholars**, Faculty of Arts & Science	University of Toronto
2008	**C. L. Burton Scholarship for Mathematics and Physics**, Faculty of Arts & Science	University of Toronto
2007	**Top Scholar's Scholarship**, Faculty of Arts & Science	University of Toronto
2007	**President's Entrance Scholarship**, Faculty of Arts & Science	University of Toronto

Media

Projecting the spread of Zika The Atlantic, New Scientist, Homeland Security News Wire, WBUR Boston NPR's News Station

PhD Profile: Canis lupus Graduate Student Newsletter, Northeastern University